



Western PowerWorld User Group Meeting

Tracy Rolstad
December 2018
Portland, OR

Who are we (& Why are we here?)

- Paraphrasing Admiral James Stockdale
 - Who was he? Google/Wiki him
- So, who are we?
 - PowerWorld users for sure
 - Utilities
 - Consultants
 - Inexperienced folks to the very experienced
 - Action: ID both...room experience
 - **Software Developers**
 - Developers, not sales reps
 - » Not sure PWC even has a position for a sales rep
 - Lab folks (in-between industry and academia)
 - Anyone else (CG folks, NWPP, WECC, etc)



Why are we here?

- Why are we here?
 - To create a user driven and controlled user group
 - Logistical support is up to us.
 - Feel free to host! And thanks to PWC for food, etc.
 - » And Swag!
 - Not subject to random re-org and policy decisions.
 - What is our purpose?
 - Improve our skills.
 - Educate and Inform.
 - Workshops.
 - Elevate the level of expertise in use of PowerWorld Simulator
 - Knowledge Transfer
 - Drive Development.



Two Random Slides

- Something novel about Avista
- Something novel about myself
 - and Rich Maguire (ECI)



15 Minutes of Fame (note the new fence)



Something Novel About Me (and Rich)



Expectations (Parking Lot Exercise)

- What do you want from this?
- Shameless Plug for TAMU Course
 - Interest in Tue/Wed/Thur class at A&M?
 - Mon & Fri travel days
 - Instructors would be Tom and others (utility folks)
 - Introduction to System Planning (using PWS)
 - Input on this...
 - Advanced System Planning (using PWS)
 - Input on this...
- Where and when for this?
 - Workshops more frequently?



Proposed Topics

- Advanced Tools Workshop
 - 2 days? 3 days?
 - Come prepared and be fully engaged
- Topics
 - Data
 - Good vs bad
 - Short Circuit
 - PWS vs all the rest
 - Stability
 - SLG
 - Rules of thumb for impedance
 - Detecting poor performance
 - Derivative limit monitoring



Your Turn!

- Rich and I will take notes
- Consider this meeting a reintroduction of sorts
- Again, decoupling from organizations and drive it from the bottom up



Day Two

- PRC-026
 - Larry Furumasu, CG
- MOD-033
 - Bo Gong, CG
- Break
- GENTPW
 - PW Staff
- Droop
 - PW Staff



Standards Are Confusing (PRC-026)

PRC-026-1 — Relay Performance During Stable Power Swings

A. Introduction

1. **Title:** Relay Performance During Stable Power Swings
2. **Number:** PRC-026-1
3. **Purpose:** To ensure that load-responsive protective relays are expected to not trip in response to stable power swings during non-Fault conditions.
4. An Element identified in the most recent annual Planning Assessment where relay tripping occurs due to a stable or unstable² power swing during a simulated disturbance.



Relay Models per PRC-026

PRC-026-1 — Relay Performance During Stable Power Swings

PRC-026-1 – Attachment A

This standard applies to any protective functions which could trip instantaneously or with a time delay of less than 15 cycles on load current (i.e., “load-responsive”) including, but not limited to:

- Phase distance
- Phase overcurrent
- Out-of-step tripping
- Loss-of-field



WECC RAS (drive to the WECC site)

System Stability Planning Base Case X

← → ↻ https://www.wecc.biz/SystemStabilityPlanning/Pages/BaseCases.aspx?utm_source=PopularSearches#Default=%7B... ☆

Apps www.wsc.com arpa-e: epic: Log In UltiPro

System Stability Planning

Anchor Data Set

Base Cases

Base Case Modifications

Project Coordination, Path Rating and Progress Report Processes

Project Coordination Process

Path Rating Process

Progress Reports

Modeling

PSLF Software

Round-Trip

RESET SEARCH

Year

Base Cases

WECC's base cases are computer models of projected or starting power system conditions for a specific point in time. These base cases include both steady state and dynamic data, and contain very large amounts of data necessary to model power system behavior.

The Data Preparation Manual is to be used by WECC members and any other entities owning/operating facilities in the Western Interconnection. It covers the submittal and use of both steady-state and dynamic data.

NOTE: In order to access base cases you must be an account holder who is logged in and has been granted NDA permissions via an executed non-disclosure agreement, otherwise no base cases will display below. Also, RAS and/or GMD data requires a higher level of permissions and will only be visible to those who have been granted this additional access.

Search...

Format	Title	Type	Status	Posted
RAS	2018-19 Light Winter 1 RAS	Operating	Approved/Final	2018-10-18
RAS	2018-19 Heavy Winter 3 RAS	Operating	Approved/Final	2018-10-18
RAS	2019 Heavy Spring 1 RAS	Operating	Approved/Final	2018-10-18





Data
Check

Data Check and Finding (and hopefully fixing) Bad Data (i.e. data errors)

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Education



- Tracy Rolstad
 - Diploma, Naval War College, College of Naval Command and Staff
 - BSEE, University of Idaho
 - Nuclear Navy
 - Nuclear Operational Prototype (S1C)
 - Nuclear Power School (Reactor Operator)
 - Electronics Technician School
 - Radar, Communications, etc
 - Professional Technical Education
 - Too numerous to list...



Resume...



- Avista Corporation
 - Senior Pwr Sys Consultant, System Planning
 - WECC TSS Chair, Vice Chair, Secretary, etc



- Utility System Efficiencies
 - Senior Power Systems Analyst



- The Bonneville Power Administration
 - Senior Engineer, System Operations



- The Joint Warfare Analysis Center
 - EP Senior Analyst, PACOM Chief of Targets
 - Special Technical Operations Action Officer



- Nuclear Navy (Attack Submarines)
 - Chief Petty Officer (ETC/SS)
 - Engineering Watch Supervisor



Avista

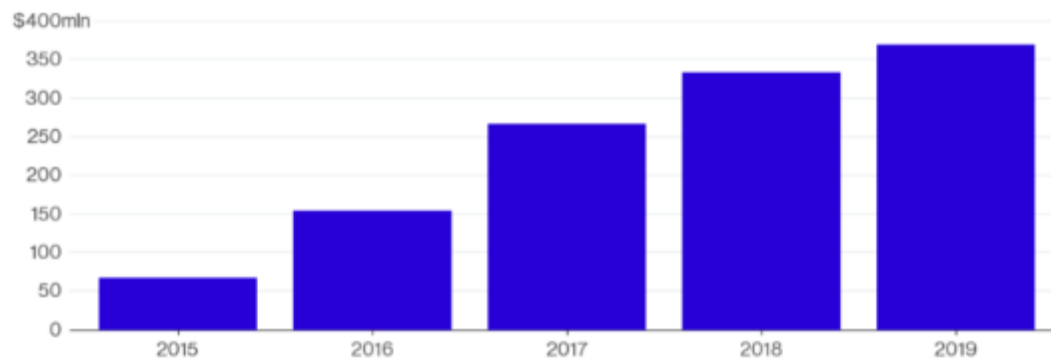
Nearly zero load growth (population only)

- Biggest of the small (~2200 MW)
 - Smallest of the big
 - 30,000 square miles (~size of SC)
- Serves Spokane (2nd largest city)
 - ZNation filmed here
 - New Load growth is “agricultural” (pays in cash)



Washington's Cash Crop: State Reaps Marijuana Tax Windfall

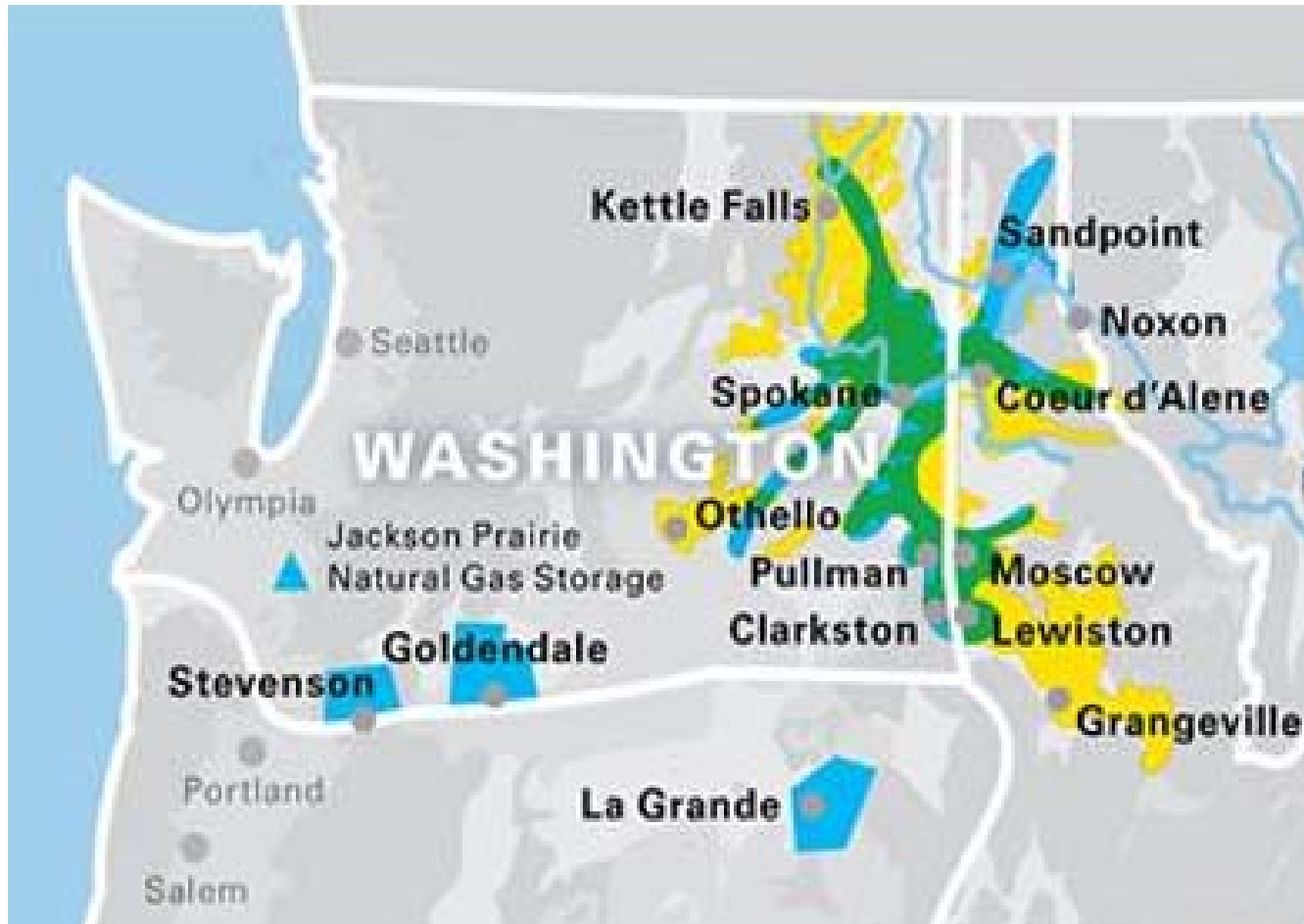
As pot sales climb, so does state's share of the revenue



Source: Washington Economic & Revenue Forecast Council

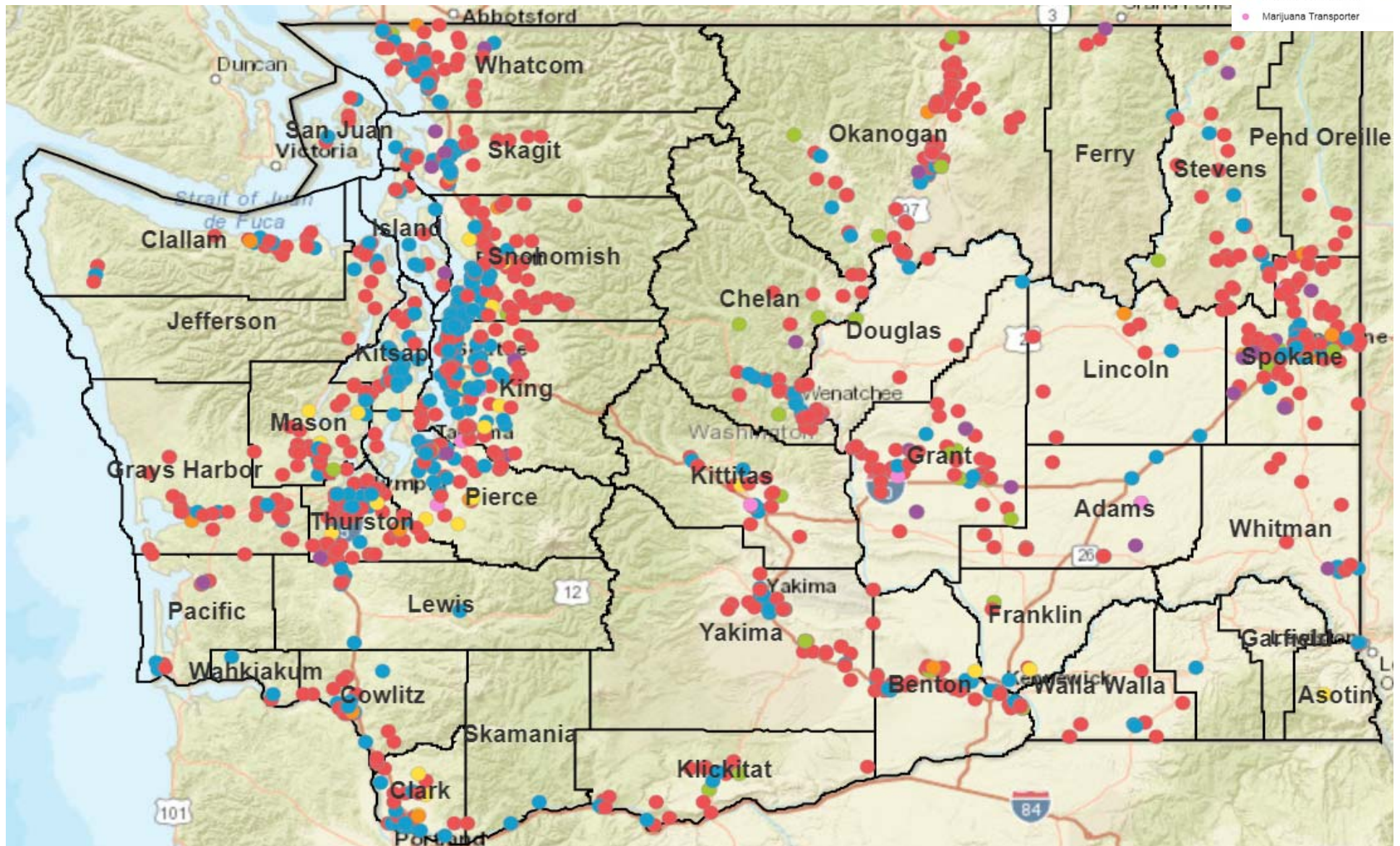


Service Territory



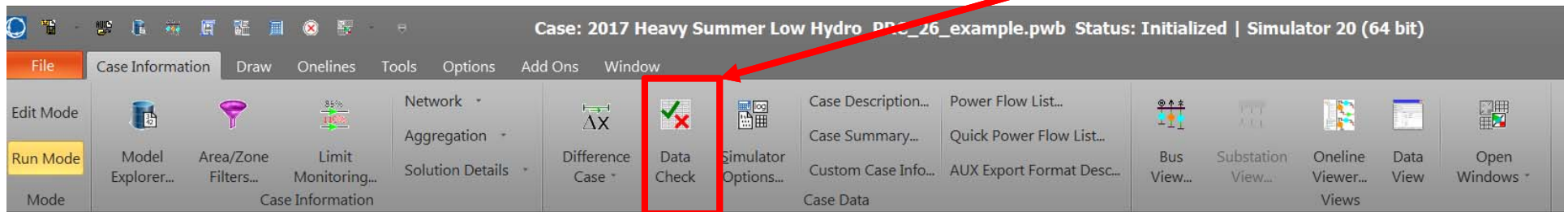


Ag Load Growth Activities in WA



Enough of the Warm Up Slides

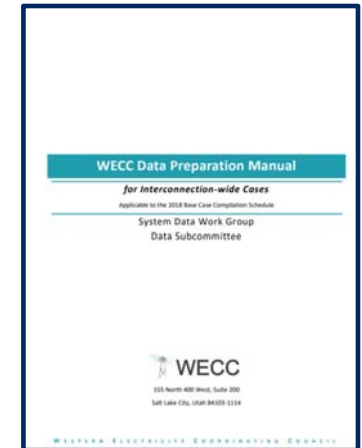
- We want to talk about the “new” tool
- Data Check



- Most of the work is done for you btw
 - Shout out to the various Johns...
 - RepLog Reproduced in PWS *.aux
 - <https://www.powerworld.com/knowledge-base/new-feature-data-check>



RepLog?



- Representation Log

- *.epc's run by WECC staff to measure submitted data (*.epc and *.dyd for example) against the WECC Data Preparation Manual
 - <https://www.wecc.biz/Reliability/2018%20WECC%20Data%20Preparation%20Manual.pdf>
- The RepLog is NOT a catch all for detecting bad or incorrect data however...
 - There is always a new way to make mistakes!
 - Ask me how I know...
- The RepLog is now inside of PowerWorld Simulator via Data Check



Data Check in Action: Step by Step

- Step 1: Load the case data (everything)
 - Power Flow Data
 - Transient Stability Data
- Step 2: Load the *.aux file
- Step 3: Open Data Check and Ponder the Results
 - Why do these matter?
 - Are these enough?
- Step 4: Other ways to check data
 - How you can build on these



Where Does Data Come From?

- Input Please.
 - FAC and MOD standards drive this





Data: R, X, B

- We gather data
- FAC Standard!

2017 System Data Book

Avista Utilities
Engineering & System Operations
P.O. Box 3727
Spokane, WA 99220

AVISTA Utilities		System Data		230kV Transmission Lines		Electrical Properties Report						Revision Date: 04-Apr-17				
Line Description	Length (miles)	Str	GMD (feet)	Conductor	Section Impedance (ohms)						10 ⁻⁶ (mho)	Section Impedance (pu on 100MVA @ 230kV)				
					R1	X1	Z1	R0	X0	Z0	Y1	R1	X1	R0	X0	Y1
Beacon-Bell #4																
Beacon-Chg.1	0.05	HF	24.25	1272 ACSS Blttern	0.004	0.038	0.038	0.031	0.110	0.114	0.28	0.00001	0.00007	0.00006	0.00021	0.00015
Chg.1-Chg.2	0.48	SDC	27.68	1272 ACSS Blttern	0.039	0.374	0.376	0.295	1.041	1.082	2.61	0.00007	0.00071	0.00056	0.00197	0.00138
Chg.2-End Shld	0.52	HF	24.25	1272 ACSS Blttern	0.042	0.397	0.399	0.320	1.145	1.189	2.89	0.00008	0.00075	0.00060	0.00216	0.00153
End Shld-Chg.3	3.85	HF	24.25	1272 ACSS Blttern	0.313	2.940	2.957	1.414	9.591	9.694	21.39	0.00059	0.00556	0.00267	0.01813	0.01131
Chg.3-Beg Shld	0.34	HF	24.25	1590 ACSS Lapwing	0.023	0.255	0.256	0.120	0.843	0.851	1.92	0.00004	0.00048	0.00023	0.00159	0.00102
Beg Shld-Chg.4	0.76	HF	24.25	1272 ACSS Blttern	0.062	0.580	0.584	0.467	1.673	1.737	4.22	0.00012	0.00110	0.00088	0.00316	0.00223
Chg.4-Bell (BPA)	0.30	HF	24.25	1272 ACSS Blttern	0.024	0.229	0.230	0.185	0.660	0.686	1.67	0.00005	0.00043	0.00035	0.00125	0.00088
Section 1 Total:	6.30				0.506	4.815	4.841	2.831	15.063	15.327	34.98	0.00096	0.00910	0.00535	0.02847	0.01850
Beacon-Bell #4	6.30			partially shielded	0.506	4.815	4.841	2.831	15.063	15.327	34.98	0.00096	0.00910	0.00535	0.02847	0.01850

Data: SVL's (aka Bottlenecks, limits, etc)

- Limits
 - Lines
 - Xfmr
 - Caps
 - etc

☐	Type	Name	Modified	☐ Modified By
		BEACON 230kV BUS TIE BREAKER	8/7/2014 10:29 AM	Hydzik, Rich
		BEACON-BELL 4	8/7/2014 10:29 AM	Hydzik, Rich
		BEACON-BELL 5	8/7/2014 10:29 AM	Hydzik, Rich
		BEACON-BOULDER	8/7/2014 10:29 AM	Hydzik, Rich
		BEACON-RATHDRUM	8/7/2014 10:29 AM	Hydzik, Rich
		BELL-WESTSIDE	8/7/2014 10:30 AM	Hydzik, Rich
		BENEWAH-BOULDER	8/11/2014 8:20 AM	Hydzik, Rich
		BENEWAH-MOSCOW 230	12/4/2017 9:17 AM	Hydzik, Rich
		BENEWAH-PINE CREEK 230	2/5/2016 2:22 PM	Hydzik, Rich
		BENEWAH-THORNTON	8/11/2014 8:33 AM	Hydzik, Rich
		BOULDER-LANCASTER	8/7/2014 10:08 AM	Hydzik, Rich
		CABINET-NOXON	11/3/2017 4:56 PM	Hydzik, Rich
		CABINET-RATHDRUM	11/27/2017 1:03 PM	Hydzik, Rich
		COULEE-WESTSIDE	8/7/2014 10:30 AM	Hydzik, Rich

Data Check (in three parts)

- Three Tabs
 - Check results
 - Aggregation
 - Define checks

Data Check Results

Check Results | Check Aggregation Results | Define Checks

Use check boxes to show columns for the data checks

☒ Include Fields used by Data Check Filter ☒ Only objects that meet one Data Check shown

Records ▾ Geo ▾ Set ▾

	From Number	To Number	Circuit	From Name_Nominal kV	To Name_Nominal kV	Circuit	Label (for input AUX or P)
1	10010	10011	1	AMBROSIA_115.0	AMBROSIA_230.0	1	
2	10025	10024	1	B-A_345.0	B-A_115.0	1	
3	10229	10230	1	NORTON_345.0	NORTON_1_115.0	1	
4	10232	12050	1	OJO_345.0	OJO_115.0	1	
5	10289	10558	1	SAN_JUAN_69.0	SJ_SS_3WTAP_1.1	1	
6	10291	10560	1	SAN_JUAN_230.0	SJ_23_SS3WTA_1.1	1	
7	10294	10296	1	SANDIA_345.0	SANDIA_2_115.0	1	
8	10368	10370	1	WESTMESA_230.0	WESTMS_1_115.0	1	
9	10368	10371	1	WESTMESA_230.0	WESTMS_2_115.0	1	
10	10369	10370	1	WESTMESA_345.0	WESTMS_1_115.0	1	
11	10369	10371	1	WESTMESA_345.0	WESTMS_2_115.0	1	
12	16102	10382	1	MCKINLEY_345.0	YAHTAHEY_115.0	1	
13	10491	10490	1	LRDSBGG1_13.0	LB_INT_115.0	1	
14	10492	10490	1	LRDSBGG2_13.0	LB_INT_115.0	1	
15	12026	10504	1	DEMINGPG_13.0	DEMTAP2_115.0	1	
16	10557	10558	1	SANJUAN_SS_1.1	SJ_SS_3WTAP_1.1	1	
17	10559	10560	1	SJ_23_SSERV_1.1	SJ_23_SS3WTA_1.1	1	
18	10842	10843	1	JICARILLA_345.0	JICARILLA_115.0	1	
19	11003	11005	1	ALAMO_69.0	ALAMO_R_69.0	1	
20	11010	11237	1	AMRAD_345.0	AMRAD_B_345.0	1	
21	11061	11202	1	DIABLO_345.0	DIABLO_B_345.0	1	
22	11108	11190	1	LEI_115.0	APOLLO_69.0	1	
23	11110	11204	1	NEWMAN_115.0	NEWMAN_B_341.0	1	
24	11201	11202	1	DIABLO_A_13.0	DIABLO_B_345.0	1	
25	11203	11204	1	NEWMAN_A_13.0	NEWMAN_B_341.0	1	
26	12001	12002	1	ALAMOGPG_69.0	ALAMOGPG_11.0	1	
27	12010	12011	1	BLACKLAK_69.0	BLACKLAK_115.0	1	
28	12031	12030	1	GALLUPPG_24.0	GALLUPPG_115.0	1	
29	12037	12038	1	HERNANDZ_69.0	HERNANDZ_11.0	1	HERNANDZ
30	12070	12071	1	SNYSIDRO_69.0	SNYSIDRO_115.0	1	
31	12149	12158	1	CIMARRON_34.0	mid pt_115.0	1	
32	12156	12158	1	CIM_TERT_8.700	mid pt_115.0	1	
33	14100	14510	1	CHOLLA_345.0	CHOLLA_3_100.0	1	
34	14100	14511	2	CHOLLA_345.0	CHOLLA_6_100.0	2	
35	14101	14525	1	FOURCORN_34.0	FOURC1AA_100.0	1	
36	14204	14509	1	CHOLLA_230.0	CHOLLA_7_100.0	1	
37	14211	14523	1	FOURCORN_23.0	FOURCN_4_100.0	1	
38	14211	14524	2	FOURCORN_23.0	FOURCN_8_100.0	2	
39	14221	14631	1	PPAPS_W_230.0	PP_W_100.0	1	
40	14231	14585	2	WESTWNGW_2.0	WESTWG_4_100.0	2	

Close

Build a Filter First (neg load)



- Negative Load is a Thing

– Why?

- Pacific Gas and Electric is all about this
- Lately so is Avista (not deliberately)

The screenshot displays the PowerWorld software interface with two dialog boxes open over a data table.

Data Check Dialog Box:

- Format Name:** A dropdown menu.
- Buttons:** New, Save, Save As, Rename, Delete.
- Object Type:** Double Click to Choose an Object Type. Find...
- Filter Criteria:** Define...
- Show Dynamic Formatting Features:** ☐
- Data Check Section:**
 - ☒ Show
 - ☒ Show Aggregator
 - Aggregation Format:**
 - ☒ Meets
 - ☐ Meets / Total
 - ☐ Meets : Not Meets
 - ☐ Percentage
 - Aggregation Sum:**
 - ☒ Count
 - ☐ Field
- Filter Section:**
 - Filter Meets:** YES
 - Filter Not Meets String:**
 - Description:**
- Buttons:** OK, ? help, X Cancel

Choose an Object Type Dialog Box:

- Search:**
- Buttons:** Collapse All, Expand All
- Object Type List:**
 - Case Information
 - Communications
 - Contingency
 - Difference Flows
 - Fault Analysis
 - GIC
 - GIC Layer
 - Limit Monitoring
 - Network
 - Onelines
 - OPF
 - Options
 - Options by Value
 - PV
 - PVQV
 - QV
- Buttons:** OK, ? help, X Cancel

Background Table (Partial View):

Name	Object Type	Filter Name	Show	Show Aggregat	Descripti	Meets Filter	Not Meets Filter	Aggregat Weight	Aggregat Format	Active
1 CASE Missing BA	Branch	<Area>M	YES	YES		Missing E			Meets/To	YES
2 CASE Missing Rating	Branch	Missing E	YES	YES	Indication	Missing E			Meets/To	YES
3 EXCEED Limit	Branch	N-D Devic	YES	YES		Exceed Li			Meets/To	YES
4 NERC LimA> LimB	Branch	Limit A >	YES	YES		LimA>Lim			Meets/To	YES
5 NERC LimB> (B*LimA)	Branch	LimitB/Lir	YES	YES		LimB>(B*			Meets/To	YES
6 NERC Narrow Vband	Branch	Tap Step	YES	YES		Narrow V			Meets/To	YES
7 POWER Bmag > 0	Branch	Positive b	YES	YES		Bmag > C			Meets/To	YES
8 POWER NonTrans NomkV Diff	Branch	NonTrans	YES	YES		NonTrans			Meets/To	YES
9 CASE Missing BA	Bus	<Area>M	YES	YES		Missing E			Meets/To	YES
10 EXCEED Limit	Bus	Bus Volt	YES	YES		Exceed Li			Meets/To	YES
11 POWER No Connections	Bus	BusWith	YES	YES		No Conn			Meets/To	YES
12 POWER No Owner	Bus	No Own	YES	YES		No Own			Meets/To	YES
13 POWER No Zone	Bus	No Zone	YES	YES		No Zone			Meets/To	YES
14 CASE Min>Max	Gen	MWmin/Y	YES	YES		Min>Max			Meets/To	YES
15 CASE Missing BA	Gen	<Area>M	YES	YES		Missing E			Meets/To	YES
16 CASE Pmax> GovMWCap	Gen	Pmax>M	YES	YES		Pmax>M			Meets/To	YES
17 CASE Unapp Model	Gen	Unappro	YES	YES		Unappro			Meets/To	YES
18 EXCEED Limit	Gen	Gen Limit	YES	YES		Exceed Li			Meets/To	YES
19 NERC At Mvar Limit	Gen	Gen Reac	YES	YES		At Mvar L			Meets/To	YES
20 NERC Limit Power Fact	Gen	Gen Reac	YES	YES		Limit Pow			Meets/To	YES
21 NERC PSS No Ex	Gen	PSS but n	YES	YES		PSS No Ex			Meets/To	YES
22 NERC RX Ratio	Gen	Generato	YES	YES		RX Ratio			Meets/To	YES
23 NERC Unreas H	Gen	Unreas	YES	YES		Unreas H			Meets/To	YES
24 POWER Gen at 0.0	Gen	Closed G	YES	YES		Gen at 0			Meets/To	YES
25 POWER Gen on HV	Gen	Generato	YES	YES		Gen on H			Meets/To	YES
26 POWER Miss Tag	Gen	MissingG	YES	YES		Miss Tag			Meets/To	YES
27 POWER Miss Turbine Type	Gen	Missing T	YES	YES		Miss Turb			Meets/To	YES
28 POWER Missing Model	Gen	Missing M	YES	YES		Missing M			Meets/To	YES
29 POWER Missing PS	Gen	Missing F	YES	YES		Missing F			Meets/To	YES
30 POWER No Owner	Gen	No Own	YES	YES		No Own			Meets/To	YES
31 CASE Miss Long ID	Load	Missing L	YES	YES		Miss Lon			Meets/To	YES
32 CASE Missing BA	Load	<Area>M	YES	YES		Missing E			Meets/To	YES
33 NERC Power Fact	Load	Power Lo	YES	YES		Power Fa			Meets/To	YES
34 POWER PPA/IND LongID AGC	Load	PPA or IN	YES	YES		PPA/IND			Meets/To	YES

Slightly Unexpected Interface

